

Industry  
CanadaIndustrie  
Canada

Canada

Français	Contact Us	Help	Search	Canada Site
Home	Site Map	What's New	About Us	Registration

— Strategis Index:  
 strategis.gc.ca — A B C D E F G H I J K L M N O P Q R S T U V W X Y  
Z

 CIPO  OPIC

 CIPO  
HOME

The Canadian Intellectual Property Office

Canadian Patent Database

 (12) **Patent Application:**

08/24/2001 - 09:44:44

 (11) **CA 2220465**

(54) AQUEOUS POWDER COATING DISPERSION

(54) DISPERSION AQUEUSE DE PEINTURE PULVERULENTE

[View or Download Images](#)

- (72) Inventors (Country): **WOLTERING, Joachim** (Germany (Federal Republic of))  
**MÖLLER, Dietmar** (Germany (Federal Republic of))
- (73) Owners (Country): **BASF COATINGS**  
**AKTIENGESELLSCHAFT** (Germany (Federal Republic of))
- (71) Applicants (Country): **BASF LACKE + FARBEN**  
**AKTIENGESELLSCHAFT** (Germany (Federal Republic of))
- (74) Agent: **FETHERSTONHAUGH & CO.**
- (45) Issued on:
- (22) Filed on: **May 9, 1996**
- (43) Laid open on: **Nov. 28, 1996**
- (51) International Class (IPC): **C09D 5/03; C08J 3/05; C09D 133/14**

 Patent Cooperation Treaty (PCT): **Yes**

(85) <u>National entry on</u> :	<b>Nov. 6, 1997</b>
(86) <u>PCT Filing number</u> :	<b>PCT/EP96/01959</b>
(87) <u>International publication number</u> :	<b>WO96/37561</b>

 (30) Application priority data:

Application No.	Country	Date
195 18 392.4	Germany (Federal Republic of)	May 19, 1995

Availability of licence:

N/A

Language of filing:

English

---

**ABSTRACT:**

The present invention concerns an aqueous powder coating dispersion consisting of a solid powder component A and an aqueous component B. Component A is a powder coating containing (a) at least one epoxy-containing binder including a quantity (30-45 %, preferably 30-35 %) of glycidyl-containing monomers, optionally containing vinyl-aromatic compounds, preferably styrene; (b) at least one cross-linking agent, preferably straight-chain aliphatic dicarboxylic acids and/or carboxy-functional polyesters; and (c) optionally, catalysts, auxiliary agents, powder-coating typical additives such as degassing agents, levelling agents, UV-absorbents, radical capturers and antioxidants. Component (B) is an aqueous dispersion containing (a) at least one non-ionic thickening agent; and (b) optionally, catalysts, auxiliary agents, antifoaming agents, dispersants, wetting agents, preferably carboxyfunctional dispersants, antioxidants, UV-absorbents, radical capturers, biocides, small quantities of solvents and/or water retaining agents. Also object of the invention is a process for producing the powder coating dispersion and the use of the dispersion for motor vehicle bodies.

**CLAIMS:** Show all claims

\*\*\* Note: Data on abstracts and claims is shown in the official language in which it was submitted.

---

**View or Download Images :**

- ☐ Cover Page Image
- ☐ Abstract Image
- ☐ Claims Image
- ☐ Disclosures Image
- ☒ Drawings Image

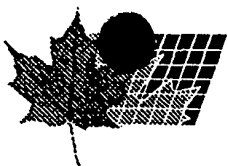
View the Image

Download in Adobe PDF

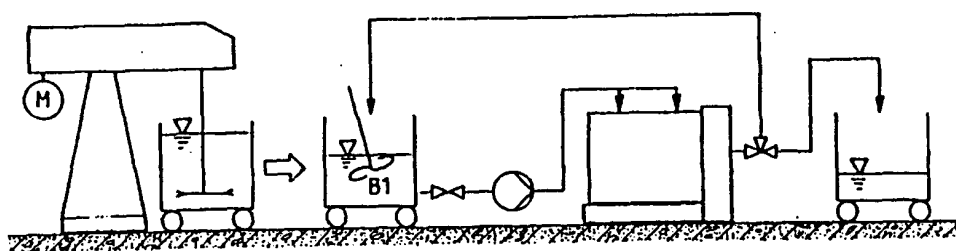
[Top of Page](#)

Last Modified: 2001/06/13

[Important notices and disclaimers](#)  
[Privacy Statement](#)



(72) MÖLLER, Dietmar, DE  
(72) WOLTERING, Joachim, DE  
(71) BASF LACKE UND FARBEN AKTIENGESELLSCHAFT, DE  
(51) Int.Cl.<sup>6</sup> C09D 5/03, C08J 3/05, C09D 133/14  
(30) 1995/05/19 (195 18 392.4) DE  
(54) **DISPERSION AQUEUSE DE PEINTURE PULVERULENTE**  
(54) **AQUEOUS POWDER COATING DISPERSION**



(57) L'invention concerne une dispersion aqueuse de peinture pulvérulente qui comprend un constituant A pulvérulent solide et un constituant B aqueux. Le constituant A est une peinture pulvérulente contenant: a) au moins un liant époxydique contenant entre 30 et 45 %, de préférence entre 30 et 35 % de monomères glycidiques contenant éventuellement des composés vinylaromatiques, de préférence du styrène, b) au moins un réticulant, de préférence des acides dicarboxyliques aliphatiques à chaîne linéaire et/ou des polyesters carboxyfonctionnels et c) éventuellement des catalyseurs, des adjuvants, des additifs propres aux peintures pulvérulentes, tels que des agents de dégazage, des produits nivelants, des absorbeurs d'U.V., des absorbeurs de radicaux, des biocides, des volumes réduits de solvants et/ou de rétenteurs d'eau. L'invention concerne en outre un procédé de production de cette dispersion de peinture pulvérulente, ainsi que son utilisation pour des carrosseries d'automobiles.

(57) The present invention concerns an aqueous powder coating dispersion consisting of a solid powder component A and an aqueous component B. Component A is a powder coating containing (a) at least one epoxy-containing binder including a quantity (30-45 %, preferably 30-35 %) of glycidyl-containing monomers, optionally containing vinyl-aromatic compounds, preferably styrene; (b) at least one cross-linking agent, preferably straight-chain aliphatic dicarboxylic acids and/or carboxy-functional polyesters; and (c) optionally, catalysts, auxiliary agents, powder-coating typical additives such as de-gassing agents, levelling agents, UV-absorbents, radical capturers and antioxidants. Component (B) is an aqueous dispersion containing (a) at least one non-ionic thickening agent; and (b) optionally, catalysts, auxiliary agents, antifoaming agents, dispersants, wetting agents, preferably carboxy-functional dispersants, antioxidants, UV-absorbents, radical capturers, biocides, small quantities of solvents and/or water retaining agents. Also object of the invention is a process for producing the powder coating dispersion and the use of the dispersion for motor vehicle bodies.

PAT 95

16.04.1996

BASF Lacke + Farben AG

Aqueous powder coating dispersion~~FILED IN THE PATENT OFFICE~~  
TEXT TRANSLATION

Th pres nt invention relates to an aqueous powder coating dispersion which is particularly suitable as a coating for car bodies which have been coated with aqueous basecoat.

For the coating of car bodies, preference is currently given to the use of liquid coating materials. These cause numerous environmental problems owing to their solvent content. The same applies to cases where water-based coating materials are employed.

For this reason, increased efforts have been made in recent years to use powder coatings for the coating operation. The results so far, however, are not satisfactory; in particular, increased coat thicknesses are necessary in order to achieve a uniform appearance. On the other hand, the use of pulverulent coating materials entails a different application technology. Plants designed for liquid coating materials, therefore, cannot be used for the powders. The aim is therefore to develop powder coatings in the form of aqueous dispersions which can be processed with liquid coating technologies.

US Patent 4268542, for example, discloses a process in which a powder coating slurry is used which is suitable for the coating of cars. In this process, a conventional powder coat is first applied to the body, and the clearcoat slurry is applied as second coat. In

this clearcoat slurry, which is based on acrylate resins, ionic thickeners are used. Furthermore, in one of the examples these thickeners contain from 0.5 to 30% of glycidyl-containing monomers. Moreover, high stoving  
5 temperatures (above 160°C) are necessary.

The present invention has now set itself the object of providing an aqueous powder coating dispersion which can be applied to car bodies by the existing liquid coating technology and which, in particular, can be  
10 stoved even at temperatures of 130°C.

This object is achieved in that the aqueous powder coating dispersion can be prepared by subjecting an aqueous dispersion of a powder coating having a glass transition temperature of from 20 to 90°C, preferably  
15 from 40 to 70°C, a viscosity of from 10 to 1000 mPas, preferably from 50 to 300 mPas, at a shear rate of 500 s<sup>-1</sup> and a solids content of from 10 to 50%, preferably from 20 to 40%, to a grinding process while maintaining a temperature of from 0 to 60°C, preferably  
20 from 5 to 35°C. The specific energy proposal [sic] during the grinding process is preferably from 20 to 500 Wh/kg, in particular from 50 to 250 Wh/kg.

An aqueous powder coating dispersion employed in accordance with the invention comprises a solid,  
25 pulverulent component A and an aqueous component B, in which

component A. is a powder coating comprising

a) at least one epoxide-containing binder with a

- 3 -

content of from 30 to 45%, preferably from 30 to 35%, of glycidyl-containing monomers and, if desired, with a content of aromatic vinyl compounds, preferably styrene,

- 5    b)    at least one crosslinking agent, preferably straight-chain aliphatic dicarboxylic acids and/or carboxy-functional polyesters, and
- c)    if desired, catalysts, auxiliaries, typical powder coating additives, such as degassing agents,
- 10    levelling agents, UV absorbers, free-radical scavengers and antioxidants,

and

component B. is an aqueous dispersion comprising

- a)    at least one nonionic thickener and
- 15    b)    if desired, catalysts, auxiliaries, defoaming agents, dispersion auxiliaries, wetting agents, preferably carboxy-functional dispersants, antioxidants, UV absorbers, free-radical scavengers, small quantities of solvent, antioxidants, UV
- 20    absorbers, free-radical scavengers, small quantities of solvent, [sic] levelling agents, biocides and/or hygroscopic agents.

Dispersions with such a composition are used in particular for powder clearcoats.

- 25            Suitable epoxy-functional binders for the solid powder coating used to prepare the dispersion are, for example, polyacrylate resins which contain epoxide groups

and which can be prepared by copolymerization of at least one ethylenically unsaturated monomer containing at least one epoxide group in the molecule with at least one other ethylenically unsaturated monomer containing no epoxide group in the molecule, at least one of the monomers being an ester of acrylic acid or methacrylic acid. Epoxide group-containing polyacrylate resins of this kind are known, for example, from EP-A-299 420, DE-B-22 14 650, DE-B-27 49 576, US-A-4,091,048 and US-A-3,781,379).

10           Examples of ethylenically unsaturated monomers containing no epoxide group in the molecule are alkyl esters of acrylic and methacrylic acid containing 1 to 20 carbon atoms in the alkyl radical, especially methyl acrylate, methyl methacrylate, ethyl acrylate, ethyl  
15 methacrylate, butyl acrylate, butyl methacrylate, 2-ethylhexyl acrylate and 2-ethylhexyl methacrylate. Other examples of ethylenically unsaturated monomers containing no epoxide groups in the molecule are acid amides, for example acrylamide and methacrylamide,  
20 aromatic vinyl compounds, such as styrene, methylstyrene and vinyltoluene, nitriles, such as acrylonitrile and methacrylonitrile, vinyl halides and vinylidene halides, such as vinyl chloride and vinylidene fluoride, vinyl esters, for example vinyl acetate, and hydroxyl-  
25 containing monomers, for example hydroxyethyl acrylate and hydroxyethyl methacrylate.

The polyacrylate resin containing epoxide groups usually has an epoxide equivalent weight of from 400 to 2500, preferably from 420 to 700, a number-average

molecular weight (determined by gel permeation chromatography using a polystyrene standard) of from 2000 to 20,000, preferably from 3000 to 10,000, and a glass transition temperature ( $T_g$ ) of from 30 to 80°C, preferably from 40 to 70°C, particularly preferably from 40 to 60°C (measured by means of Differential Scanning Calorimetry (DSC)). A temperature of about 50°C is very particularly preferred. It is also possible to employ mixtures of two or more acrylate resins.

10           The polyacrylate resin containing epoxide groups can be prepared in accordance with generally well-known methods by polymerization.

Suitable crosslinking agents are carboxylic acids, especially saturated, straight-chain aliphatic dicarboxylic acids having 3 to 20 carbon atoms in the molecule. Very particular preference is given to the use of decane-1,12-dicarboxylic acid. To modify the properties of the finished powder clearcoats it is also possible, if desired, to employ other carboxyl-containing crosslinking agents. Examples hereof which may be mentioned are saturated branched or unsaturated straight-chain di- and polycarboxylic acids, and also polymers containing carboxyl groups.

Also suitable are powder coatings comprising an epoxy-functional crosslinking agent and an acid-functional binder.

Examples of suitable acid-functional binders are acidic polyacrylate resins which can be prepared by copolymerizing at least one ethylenically unsaturated



monomer containing at least one acid group in the molecule with at least one other ethylenically unsaturated monomer containing no acid group in the molecule.

5           The binder containing epoxide groups or the crosslinking agent containing epoxide groups and the carboxyl- [sic] or, respectively, the binder are usually employed in a quantity such that there are from 0.5 to 1.5, preferably from 0.75 to 1.25, equivalents of  
10 carboxyl groups per equivalent of epoxide groups. The quantity of carboxyl groups present can be determined by titration with an alcoholic KOH solution.

          In accordance with the invention the binder comprises aromatic vinyl compounds, especially styrene.  
15 In order to limit the danger of cracking, however, the content is not more than 35% by weight. From 10 to 25% by weight is preferred.

          The solid powder coatings comprise, if desired, one or more suitable catalysts for the epoxy resin  
20 curing. Suitable catalysts are phosphonium salts of organic or inorganic acids, quaternary ammonium compounds, amines, imidazole and imidazole derivatives. The catalysts are in general employed in proportions of from 0.001% by weight to about 2% by weight, based on the  
25 overall weight of the epoxy resin and of the crosslinking agent.

          Examples of suitable phosphonium catalysts are ethyl triphenylphosphonium iodide, ethyltriphenylphosphonium chloride, ethyltriphenylphosphonium

thiocyanate, ethyltriphenylphosphonium acetate/acetic acid complex, tetrabutylphosphonium iodide, tetrabutylphosphonium bromide and tetrabutylphosphonium acetate/acetic acid complex. These and other suitable phosphonium catalysts are described, for example, in US-A 3,477,990 and US-A 3,341,580.

Examples of suitable imidazole catalysts are 2-styrylimidazole, 1-benzyl-2-methylimidazole, 2-methylimidazole and 2-butyylimidazole. These and other imidazole catalysts are described, for example, in Belgian Patent No. 756,693.

The solid powder coatings can additionally, if desired, comprise auxiliaries and additives as well. Examples of these are levelling agents, antioxidants, UV absorbers, free-radical scavengers, flow aids and degassing agents such as, for example, benzoin.

Suitable levelling agents are those based on polyacrylates, polysiloxanes and/or fluorine compounds.

Antioxidants which can be employed are reducing agents, such as hydrazides and phosphorus compounds, and also free-radical scavengers, for example 2,6 di-tert-butylphenol [sic] derivatives.

UV absorbers which can be used are preferably triazines and benzotriphenol.

As free-radical scavengers which can be employed, preference is given to 2,2,6,6 tetramethylpiperidine derivatives.

As a further constituent the aqueous component B of the powder coating dispersion contains at least one

nonionic thickener a). Preference is given to the use of nonionic associative thickeners a). Structural features of such associative thickeners a) are :

- 5           aa) a hydrophilic structure which ensures adequate solubility in water, and
- ab) hydrophobic groups which are capable of associative interaction in the aqueous medium.

Examples of hydrophobic groups employed are long-chain alkyl radicals, for example dodecyl, hexadecyl or  
10 octadecyl radicals, or alkaryl radicals, for example octylphenyl or nonylphenyl radicals.

Hydrophilic structures employed are preferably polyacrylates, cellulose ethers or, with particular preference, polyurethanes, which comprise the hydrophobic  
15 groups as polymer units.

As hydrophilic structures, very particular preference is given to the use of polyurethanes comprising polyether chains as structural units, preferably comprising polyethylene oxide. In the synthesis of such polyether-  
20 polyurethanes, the di- and/or polyisocyanates, preferably aliphatic diisocyanates, particularly preferably unsubstituted or alkyl-substituted 1,6-hexamethylene diisocyanate, serve for the linking of the hydroxyl-terminated polyether units with one another and for the linking of  
25 the polyether units with the hydrophobic end group units, which may for example be monofunctional alcohols and/or amines having the long-chain alkyl radicals or aralkyl

radicals already mentioned.

Component B can additionally comprise catalysts, levelling agents, antioxidants, UV absorbers, free-radical scavengers and wetting agents. Suitable substances in this context are essentially those already listed for component A.

Further agents which can be added to component B are auxiliaries, defoaming agents, dispersion auxiliaries, biocides, solvents and neutralizing agents.

10 Suitable defoaming agents are preferably modified polysiloxanes.

Preferred examples of dispersion auxiliaries are ammonium or metal salts of polycarboxylates.

15 Neutralizing agents which can be used are amines, ammonia and metal hydroxides.

The solid powder coatings are prepared by known methods (cf. e.g. product information sheet "Pulverlacke" [Powder coatings] from BASF Lacke + Farben AG, 1990) by homogenization and dispersion, for example by means of an extruder, screw-type compounding unit, and the like. After the powder coatings have been prepared, they are prepared for dispersion by grinding and, if appropriate, by classifying and screening.

25 The aqueous powder clearcoat dispersion can subsequently be prepared from the dry-ground powder coating by wet grinding or by introduction with stirring. Wet grinding is particularly preferred.

Accordingly, the present invention also relates to a process for the preparation of an aqueous powder

coating dispersion, in the course of which this dispersion of a powder coating having a glass transition temperature of from 20 to 90°C, preferably from 40 to 70°C, and a viscosity of from 10 to 1000 mPas, preferably  
5 from 50 to 300 mPas, is prepared at a shear rate of 500 s<sup>-1</sup> and a solids content of from 10 to 50%, preferably from 20 to 40%, this dispersion is ground while maintaining a temperature of from 0 to 60°C, preferably from 5 to 35°C, a pH of from 4.0 to 7.0,  
10 preferably from 5.5 to 6.5, is established and the dispersion is filtered.

The specific energy input during the grinding process is preferably from 20 to 500 Wh/kg.

In a preferred embodiment of the invention, the  
15 process for the preparation of an aqueous powder coating dispersion is [lacuna] on the basis of the component A described, which in accordance with the invention is dispersed in a component B. The latter comprises an aqueous dispersion of at least one nonionic thickener  
20 and, if desired, of catalysts, auxiliaries, antifoam agents, antioxidants, wetting agents, UV absorbers, free-radical scavengers, biocides, hygroscopic agents, small quantities of solvents and/or dispersion auxiliaries, preferably carboxy-functional dispersion auxiliaries.

25 In accordance with the invention, grinding is carried out after the dispersion of component A in component B.

The mean particle size obtained is between 1 and 25 µm, preferably below 20 µm. With particular preference

it is from 3 to 10  $\mu\text{m}$ .

It is an essential feature of the invention that during the grinding process the dispersion contains only small quantities of solvent. It may therefore be  
5 necessary under certain circumstances to free the grinding apparatus from solvent residues before beginning the grinding process.

Before or after wet grinding and/or the introduction of the dry powder coating into the water, it  
10 is possible for from 0 to 5% by weight of a defoamer mixture, an ammonium and/or alkali metal salt, a carboxyl-functional or nonionic dispersion auxiliary, a wetting agent and/or a thickener mixture, and the other additives, to be added to the dispersion.

15 In accordance with the invention, defoamers, dispersion auxiliaries, wetting agents and/or thickeners are first of all dispersed in water. Then small portions of the powder clearcoat are stirred in. Subsequently, defoamers, dispersion auxiliaries, thickeners and wetting  
20 agents are again incorporated by dispersion. Finally, powder clearcoats are again stirred in in small portions.

In accordance with the invention, the pH is preferably established using ammonia or amines. In this context the pH may initially rise, so that a strongly  
25 basic dispersion is produced. However, the pH falls back to the values indicated above within a period of several hours or days.

The powder coating dispersion according to the invention can be used in particular in the form of a

clearcoat as a coating over basecoats, preferably in the automotive industry. Such a clearcoat dispersion is particularly suitable for aqueous basecoats based on a polyester, a polyurethane resin and an amino resin.

5           The powder coating dispersions according to the invention can be applied by methods known from liquid coating technology. They can in particular be applied by spray techniques. Also suitable are electrostatically assisted high-speed rotation or pneumatic application.

10           The powder clearcoat dispersions applied to the basecoat are in general flashed off before stoving. This is expediently carried out first at room temperature and then at slightly elevated temperature. In general the elevated temperature is from 40 to 70°C, preferably from  
15 50 to 65°C. The flash-off time is from 2 to 10 minutes, preferably from 4 to 8 minutes at room temperature. At elevated temperature, flashing off is repeated for the same period of time.

          Stoving can be carried out at temperatures from  
20 as low as 130°C. It is possible to carry out stoving at from 130 to 180°C, preferably from 135 to 155°C.

          Using the process according to the invention it is possible to achieve coat thicknesses of from 30 to 50  $\mu\text{m}$ , preferably from 35 to 45  $\mu\text{m}$ . Clearcoats of  
25 comparable quality could hitherto, in accordance with the prior art, be achieved, with the use of powder clearcoats, only by applying coat thicknesses of from 65 to 80  $\mu\text{m}$ .

Examp1 of the production of a powder slurry

The equipment used to produce the powder slurry and the procedure are depicted diagrammatically in Figures 1 and 2.

5           The production process is as follows:

1.   Weighing-in of the liquid components

Deionized water, thickeners, wetting agents and dispersants are introduced over a dissolver in the container B1. After adding the powder to the  
10       liquids, the batch is subjected to the action of the dissolver for 20 minutes (peripheral disc speed 20 m/s).

2.   Initial flushing of the stirred ball mill

Before the beginning of wet grinding, the mill is  
15       flushed with a mixture of deionized water and the additives contained in the product until the machine is free from other solvents.

3.   Wet grinding

The product batch described in 1. is ground with the  
20       aid of a stirred ball mill. For this purpose the product is supplied to the mill by means of a pump and is circulated around the mill until the desired end quality ( $x_{50} < 4 \mu$ ,  $x_{\max} < 10 \mu$ ) is reached with a specific energy input of about 60 Wh/kg. The  
25       maximum temperature reached is less than 25°C.

4.   Completion of the powder slurry

After wet grinding, the powder slurry is made up. This is done by adding additional small quantities



- 14 -

of additives (thickeners, wetting agents, amine) with stirring.

5. Filtration

5      Filtration is carried out as shown in Fig. 2. The powder slurry is initially filtered in circulation with bag filters (PONG 50). Filtration is subsequently carried out in one pass over the same bag filters into a clean container. The slurry is then dispensed into its final containers.

Patent claims

1. Aqueous powder coating dispersion, characterized in that it can be prepared by subjecting an aqueous dispersion of a powder coating having a glass transition  
5 temperature of from 20 to 90°C, preferably from 40 to 70°C, a viscosity of from 10 to 1000 mPas, preferably from 50 to 300 mPas, at a shear rate of 500 s<sup>-1</sup> and a solids content of from 10 to 50%, preferably from 20 to 40%, to a grinding process while maintaining a  
10 temperature of from 0 to 60°C, preferably from 5 to 35°C.
2. Aqueous powder coating dispersion according to Claim 1, characterized in that the specific energy input during the grinding process is between 20 and 500 Wh/kg, preferably from 50 to 250 Wh/kg.
- 15 3. Aqueous powder coating dispersion according to Claim 1 or 2, characterized in that it is subjected to after-dispersion following wet grinding and making up.
4. Aqueous powder coating dispersion according to Claim 1 or 3, characterized in that it is a powder  
20 clearcoat dispersion.
5. Aqueous powder coating dispersion according to one of Claims 1 to 4, characterized in that it comprises a solid, pulverulent component A and an aqueous component B, in which  
25 component A. is a powder coating comprising
  - a) at least one epoxide-containing binder with a content of from 30 to 45% by weight, preferably from 30 to 35% by weight, of glycidyl-containing monomers

and, if desired, with a content of aromatic vinyl compounds, preferably styren ,

- b) at least one crosslinking agent, preferably straight-chain aliphatic dicarboxylic acids and/or carboxy-functional polyesters, and
- c) if desired, catalysts, auxiliaries, typical powder clearcoat additives, such as degassing agents, levelling agents, UV absorbers, free-radical scavengers and antioxidants,

10 and

component B. is an aqueous dispersion comprising

- a) at least one nonionic thickener and
- b) if desired, catalysts, auxiliaries, defoaming agents, wetting agents, dispersion auxiliaries, preferably carboxy-functional dispersants, antioxidants, UV absorbers, free-radical scavengers, biocides, small quantities of solvent, levelling agents, neutralizing agents, preferably amines, and/or hygroscopic agents.

20 6. Aqueous powder coating dispersion according to one of Claims 1 to 4, characterized in that its pH is between 4.0 and 7.0, preferably between 5.5 and 6.5.

7. Aqueous powder coating dispersion according to either of Claims 5 and 6, characterized in that the content of aromatic vinyl compounds in the epoxide-containing binder is not more than 35% by weight, preferably 10-25% by weight, based on component Aa).

8. Aqueous powder coating dispersion according to one of Claims 5 to 7, characterized in that the epoxide-functional binders are polyacrylate resins which contain epoxide groups, the epoxide-functional monomers employed preferably being glycidyl acrylate, glycidyl methacrylate and allyl glycidyl esters.
9. Aqueous powder clearcoat dispersion according to one of Claims 5 to 8, characterized in that component B comprises as nonionic thickener a) at least one nonionic associative thickener whose structural features include:  
aa) a hydrophilic structure and  
ab) hydrophobic groups which are capable of associative interaction in the aqueous medium.
10. Aqueous powder clearcoat dispersion according to Claim 9, characterized in that the nonionic associative thickener a) comprises polyurethane chains as hydrophilic structure aa).
11. Aqueous powder clearcoat dispersion according to Claim 10, characterized in that the nonionic associative thickener a) comprises polyurethane chains with polyether units as hydrophilic structure aa).
12. Aqueous powder coating dispersion according to one of Claims 5 to 11, characterized in that the particle size is not more than 20  $\mu\text{m}$ , preferably from 1 to 10  $\mu\text{m}$ .
13. Aqueous powder coating dispersion according to one of Claims 5 to 12, characterized in that the solvent content is 0-10%.
14. Process for the preparation of the aqueous powder coating dispersion according to one of Claims 1 to 10,

characterized in that an aqueous dispersion of a powder coating having a glass transition temperature of from 20 to 90°C, preferably from 40 to 70°C, and a viscosity of from 10 to 1000 mPas, preferably from 50 to 300 mPas, is prepared at a shear rate of 500 s<sup>-1</sup> and a solids content of from 10 to 50%, preferably from 20 to 40%, this dispersion is ground while maintaining a temperature of from 0 to 60°C, preferably from 5 to 35°C, a pH of from 4.0 to 7.0, preferably from 5.5 to 6.5, is established, and the dispersion is filtered.

15. Process according to Claim 14, characterized in that the aqueous dispersion is prepared from a solid, pulverulent component A and an aqueous component B a dispersion [sic], in which

component A. is a powder coating comprising

- a) at least one epoxide-containing binder with a content of from 30 to 45% by weight, preferably from 30 to 35% by weight, of glycidyl-containing monomers and, if desired, with a content of aromatic vinyl compounds, preferably styrene,
- b) at least one crosslinking agent, preferably straight-chain aliphatic dicarboxylic acids and/or carboxy-functional polyesters, and
- c) if desired, catalysts, auxiliaries, typical powder coating additives, such as degassing agents, levelling agents, UV absorbers, free-radical scavengers and antioxidants,

and

component B. is an aqueous dispersion comprising

- a) at least one nonionic thickener and
- b) if desired, catalysts, auxiliaries, defoaming agents, dispersion auxiliaries, wetting agents, preferably carboxy-functional dispersants, antioxidants, UV absorbers, levelling auxiliaries, neutralizing agents, preferably amines, free-radical scavengers, small quantities of solvent, biocides and/or hygroscopic agents.

10 16. Process according to either of Claims 14 and 15, characterized in that the grinding apparatus is freed from solvent residues before the beginning of the grinding process.

15 17. Use of the aqueous powder coating dispersion according to one of Claims 1 to 13 for coating already coated and uncoated car bodies of sheet metal and/or plastic by means of electrostatically assisted high-speed rotation or pneumatic application.

Fetherstonhaugh & Co.,  
Ottawa, Canada  
Patent Agents

Abstract:

The present invention relates to an aqueous powder coating dispersion comprising a solid, pulverulent component A and an aqueous component B, in which

component A. is a powder coating comprising

- a) at least one epoxide-containing binder with a content of from 30 to 45%, preferably from 30 to 35%, of glycidyl-containing monomers and, if desired, with a content of aromatic vinyl compounds, preferably styrene,
- b) at least one crosslinking agent, preferably straight-chain aliphatic dicarboxylic acids and/or carboxy-functional polyesters, and
- c) if desired, catalysts, auxiliaries, typical powder coating additives, such as degassing agents, levelling agents, UV absorbers, free-radical scavengers and antioxidants,

and

component B. is an aqueous dispersion comprising

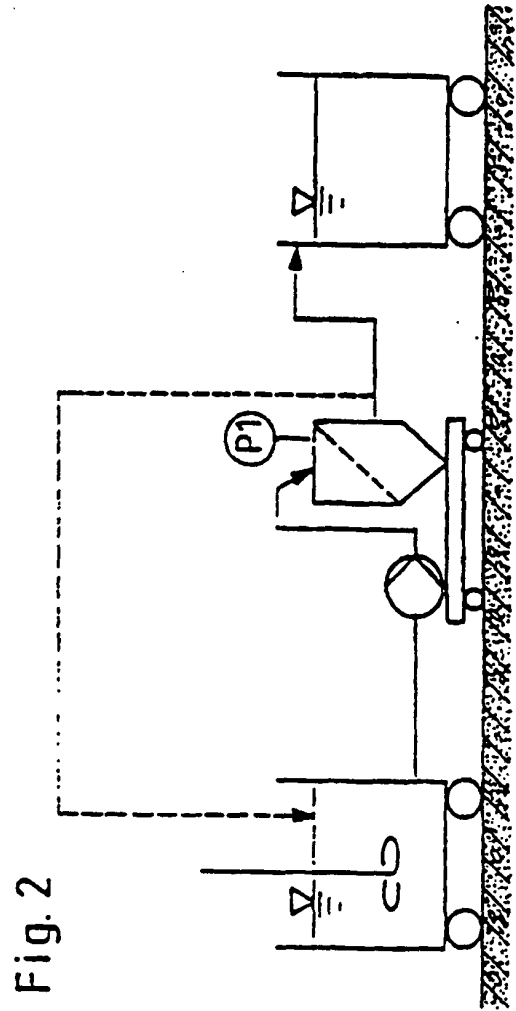
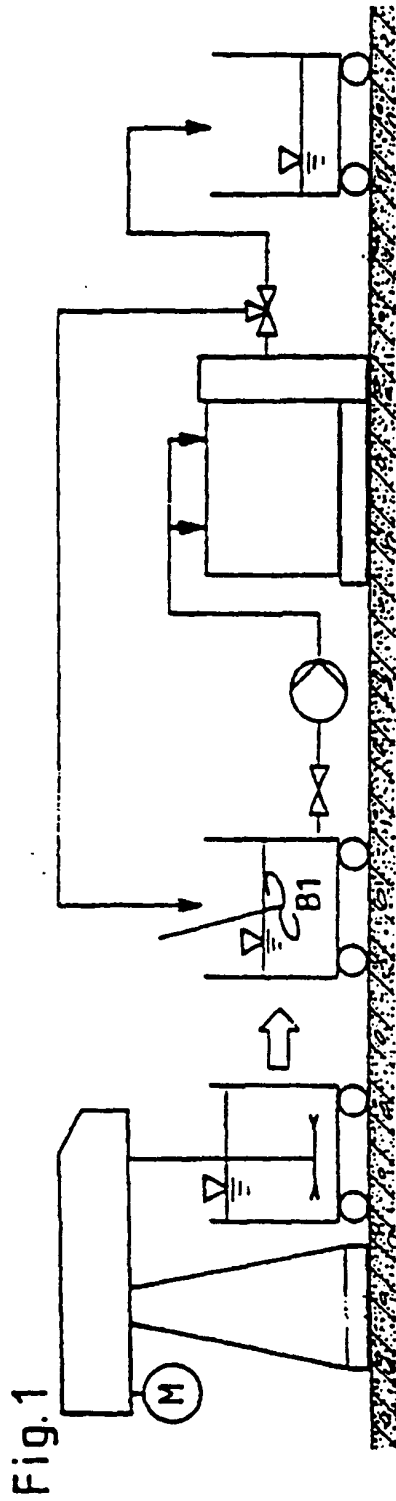
- a) at least one nonionic thickener and
- b) if desired, catalysts, auxiliaries, defoaming agents, dispersion auxiliaries, wetting agents, preferably carboxy-functional dispersants, antioxidants, UV absorbers, free-radical scavengers, biocides, small quantities of solvent and/or

- 21 -

hygroscopic agents.

The applicati n also relates to a proc ss for the preparation of the powder coating dispersion and to its use for car bodies.





Patent Agents  
Fenberstonhaugh & Co.